

Sample Questions

Don't use calculators.

1. Suppose that the predicate $P(x)$ means “ x is positive”. Let the domain of interpretation D be the set \mathbb{R} of all real numbers. Express each of the following sentences in the notation of predicate logic.
 - (a) Some real numbers are positive.
 - (b) All real numbers are positive.
2. Suppose that the predicate $P(x)$ means “ x is even”.
 - (a) Let the domain of interpretation D be the set \mathbb{N} of all positive integers. Which of the following are true? Justify your answers.
 - (i) $\exists x P(x)$
 - (ii) $\forall x P(x)$
 - (b) Find a finite domain of interpretation D_1 for which the first statement is true but the second is false.
 - (c) Find a finite domain D_2 for which both statements are true.
 - (d) Find a finite domain D_3 for which both statements are false.
 - (e) Can you find a set D_4 for which the first statement is false but the second is true? Either describe your set, or explain why no such set exists.
3. For each of the predicate formulae shown below, apply the generalised de Morgan laws so as to write down a logically equivalent predicate formula in which the “negation” connective appears immediately before the predicate.
 - (a) $\sim \forall x P(x)$
 - (b) $\sim \exists x \forall y P(x, y)$
 - (c) $\sim \forall x \exists y \exists z P(x, y, z)$